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**JUL 09 2019**

**SECRETARY, BOARD OF  
OIL, GAS & MINING**



**Julie Carter <juliecarter@utah.gov>**

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**Letter to DOGM board\_John Bloom\_070919**

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**Jack Bloom <jblo13@aol.com>**  
To: juliecarter@utah.gov

Tue, Jul 9, 2019 at 2:44 PM

Julie -

I've attached a letter for the DOGM board regarding the Advanced Clean Energy Storage project near Delta, Utah. Please ensure that the board receives the letter in advance of the July board meeting.

I would also like the opportunity to speak during the meeting (July or August) at which the representatives from Magnum Development make a presentation about the energy storage project.

Thank you for your assistance,

John Bloom



**DOGM letter\_J Bloom\_070919.pdf**  
949K

John G. Bloom, PG – UT, CA  
7552 S. Misty Hollow Way  
West Jordan, UT 84084  
July 8, 2019

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**JUL 09 2019**

**SECRETARY, BOARD OF  
OIL, GAS & MINING**

Utah Division of Oil, Gas and Mining  
Mr. Ruland Gill, Board Chairman  
1594 West North Temple, Suite 1210  
Salt Lake City, Utah 84116

Dear Mr. Gill,

By way of introduction, I am a retired geologist with Bachelor's and Master's degrees and 30 years' work experience in engineering geology, primarily in the mining industry. Most recently, I was employed by Rio Tinto Kennecott as a geotechnical engineer, rising to the position of Geotechnical Superintendent at the Bingham Canyon Mine.

I am writing this letter to express my concern about creating caverns in a salt dome at the Magnum Development Advanced Clean Energy Storage project north of Delta, Utah. Based on my research and evaluation, there are geologic and geotechnical issues that I feel have not been adequately addressed and for which there are significant unknowns. Specifically, I am concerned about the following: 1) the location of the salt dome near earthquake-prone areas; 2) the presence of the Sugarville Faults above the salt dome; 3) the presence of an "anomalous zone" within the salt dome; and 4) geomechanical evaluation of the salt caverns. Each of these concerns are detailed below:

- 1) Salt dome location - The salt dome is approximately 40 miles west of the Levan segment of the Wasatch Fault. The most recent earthquake event to rupture the surface ( $> 6.5$  M) on this segment occurred about 1000 years ago. The recurrence interval for major earthquakes on the Levan segment is not well constrained. It could experience a major earthquake during the anticipated lifetime of the salt caverns. Additionally, since 1901 there have been five earthquakes between magnitude 5.1 and 6.6 on other faults within 75 miles of the salt cavern site.

Key questions to be answered: How often have major earthquakes occurred within this distance of the salt dome? How episodic or random are they, and what impact would they have on the salt dome and the caverns?

- 2) Sugarville Faults – These faults were identified during trenching in 1978 and 1979 for a geologic hazard investigation at the site of the Intermountain Power Plant (IPP.) They are exposed on the surface above the salt dome, possibly forming a graben structure. The Utah Geological Survey labels them as active faults, with the latest surface rupture occurring  $< 15000$  years ago. Surface rupture indicates an earthquake magnitude  $> 6.5$ , but exact timing of this event is unknown.

Key questions to be answered: What is the recurrence interval for similar earthquakes? What is the full extent of surface rupture? What is the dip direction of these faults? Do they extend at depth into the salt dome? How would the salt dome and salt caverns behave in response to a major earthquake on these faults?

- 3) Anomalous zone – This zone was discovered during drilling of boreholes into the salt dome. It was labeled as such because its character and significance could not be conclusively determined at the time of drilling, and that still remains true today. What is known about the zone is that it is inclined about 40 to 50 degrees from the horizontal, that it likely has a high clay content due to its high gamma response in geophysical logs, and that it is likely soft and potentially weak. It is speculated that it could be a fault penetrating the salt dome or residual sedimentary beds trapped within the salt dome. Another possibility is that it is both – weak clay-rich sedimentary beds which preferentially displace during major earthquake events. When the anomalous zone is projected to the ground surface, it daylights at the northwestern branch of the Sugarville Faults.

Key questions to be answered: What is the anomalous zone and what is the relationship between it and the Sugarville Faults? Would coring through the anomalous zone answer the questions of its composition, origin and tectonic significance?

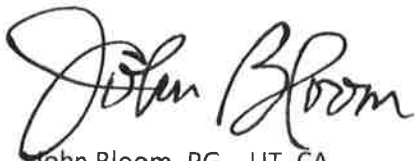
- 4) Geomechanical evaluation of the salt caverns – A geomechanical evaluation of caverns in salt domes is considered best practices, as a cavern over its lifetime will be subjected to various stresses that can affect its integrity and performance. At this site, all existing and future salt caverns that intercept the inclined anomalous zone should be analyzed for their short-term and long-term stability.

The deformation model that is created to simulate the cavern should be realistic. A critical item is to model the anomalous zone in its correct orientation. It should be an inclined feature to properly assess any shearing offset that might occur in a cavern. Modeling the anomalous zone as a horizontal feature will yield meaningless results. The geologic units should be modeled over a range of strength properties to test the sensitivity of cavern stability. Finally, the analyses should replicate conditions both statically and dynamically (i.e. simulating forces generated during an earthquake).

Key questions to be answered: How will modeling the anomalous zone as an inclined feature affect stability of a cavern? What will be the response of the caverns to dynamic analysis simulating an earthquake at the site?

It's my opinion that the questions posed in this letter should be answered satisfactorily before approval for additional caverns (in the salt dome) is permitted by DOGM. Fully addressing the concerns I have raised will ensure proper geologic and geotechnical due diligence for the project and better provide for the health and safety of persons working at the site as well as the citizens of Utah.

Respectfully,

A handwritten signature in black ink that reads "John Bloom". The signature is fluid and cursive, with the first name "John" and last name "Bloom" clearly distinguishable.

John Bloom, PG – UT, CA  
7552 S. Misty Hollow Way  
West Jordan, UT 84084